

**A Degradation Study of
Dislodgeable Methidathion Residue
on Orange Foliage in Fresno County**

By

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SUMMARY

During May and June, a degradation study of dislodgeable methidathion (Supracide) residue on orange foliage was conducted in Fresno County. The safety interval for methidathion on oranges is 30 days. Samples were collected before the application and at 8 hours, 24 hours, 48 hours, 9 days, 17 days, 23 days, and 30 days after the application. None of the sample results taken after the second day exceeded the established thion/oxon safe level value of 0.2 ug/cm^2 . This should not be interpreted as a basis for shortening the safety interval. Instead, this study substantiates that under the conditions of these orange groves and the application rates of the material, the existing safety interval is adequate. In order to help determine the fate of the methidathion and its oxone, leaf litter samples were taken from under some of the trees.

INTRODUCTION

In June 1971, the California Department of Food and Agriculture established safety intervals for specific crop/pesticide combinations. A safety interval is the time period that must elapse between the application of a pesticide and the entry of unprotected workers into the treated area. This waiting period was instituted to allow sufficient time for toxic materials to environmentally degrade to a low toxicity residue level. The adequacy of these safety intervals has not been evaluated since their introduction. This study was proposed to validate existing safety intervals. The objective of this study was to monitor the foliar decay rates of pesticides with safety intervals longer than two days. This study is one of several studies conducted in 1983 for safety interval validation.

Methidathion (Supracide) is a broad spectrum organophosphate insecticide and acaricide. It is effective against a wide variety of pests. It has both contact and stomach action (Vettorazzi, 1979). Methidathion has an oral LD₅₀ (rat) of 20 mg/kg and a dermal LD₅₀ (rat) of 25 mg/kg (NIOSH, 1980).

Knaak and Iwata (1982) established safe level values for methidathion and methidathion-oxon on foliage. These values are 0.6 ug/cm² and 0.15 ug/cm². The combined thion/oxon safe level value has been established at 0.2 ug/cm². These values represent the maximum residue level which would ensure negligible risk to the workers. This study investigated the rate at which the residue level was met. An evaluation of the toxic potential of contaminated leaf litter to the farm worker has not been done.

METHODS

With assistance from the Fresno County Agricultural Commissioner's staff, growers filing a Notice of Intent to apply methidathion were contacted. Co-operation was obtained from two growers who filed a Notice to apply Supracide 2E on oranges. Methidathion has a 30 day safety interval on oranges. The application rates were 1.5 gallons/acre and 1 gallon/acre. The dilutions were, 1 gallon to 100 gallons of water, and 1.5 gallons to 100 gallons of water.

Each orange grove was divided into two areas. One row from each area was selected. Each row was identified with markers for future sampling. Pre-application samples were collected on the day of application. Succeeding post-application samples were taken at 8 hours, 24 hours, 48 hours, 9 days, 17 days, 23 days, and 30 days. Foliar samples were collected using a 2.54 cm disk leaf punch which was cleaned with alcohol between samples. Ten trees from each row were sampled, beginning with the fourth tree in the row. Two leaf punches from each tree were taken while entering the grove and two punches from the adjacent ten trees while exiting the grove. Each sample contained 40 leaf punches. Protective equipment was worn according to worker safety regulations. Leaf litter samples were taken from under the fourth tree in each row.

Leaf punch samples were sealed with aluminum foil, capped, and stored on ice. Leaf litter samples were placed in plastic bags and stored on ice. Samples were shipped to Chemistry Laboratory Services in Sacramento for analysis. Dislodgeable residues were removed by mechanically shaking the leaf disks with a water-surfactant solution. The aqueous wash was extracted

with ethyl acetate, dried with anhydrous sodium sulfate, and concentrated or diluted as necessary. Leaf litter samples were ground up, washed in hexane and filtered. The analysis was by gas chromatography. Method sensitivity was 0.0005 ug/cm² for the dislodgeable samples and .001 PPM for the leaf litter samples. Weather conditions during the study were hot and dry with no rainfall (see appendix for weather and air pollution data).

RESULTS

Tables 1,2,3 & 4 present the analytical results for methidathion and methidathion-oxon dislodgeable samples. Sampling was terminated at day 30 since the residue levels were so low and would pose no hazard to workers. Tables 5,6,7 & 8 present the analytical results for the methidathion and methidathion-oxone leaf litter sampling.

DISCUSSION

None of the dislodgeable sample results exceeded the safe level values established by Knaak and Iwata (1982). This should not be construed as a validation of any argument to shorten the safety interval. Instead, this study only substantiates the existing safety interval as adequate, given the conditions of this orange grove and the application rate of the material. The sample population in this study was too small for the data to be directly applied as a standard for degradation rates. Existing safety intervals were established upon the degradation of maximum label application rates. Growers usually do not apply maximum rates permitted by the label in order to minimize cost and pest resistance to the material. Several factors such as, ambient and radiant temperature, humidity, solar radiation and air pollution oxidant levels may influence the degradation of pesticides. These factors were not within the scope of this study to measure and were not taken into account. Leaf litter samples showed a sporadic increase in both the methidathion and methidathion-oxone concentration. The hazard to unprotected humans working in these groves cannot be completely assessed from the information collected. Future studies incorporating more comprehensive monitoring capabilities will be necessary before any action can be considered to shorten safety intervals. However, under these conditions, there is no need to increase the interval either.

REFERENCES

1. Vettorazzi, G., International Regulatory Aspects for Pesticide Chemicals, CRC Press, Inc., Vol. 1, p. 72, (1979).
2. NIOSH, 1979 Registry of Toxic Effects of Chemical Substances, Vol. 2, p. 286, (1980).
3. Knaak, J. B. and Y. Iwata, The Safe Level Concept and the Rapid Field Method, 182, ACS Symposium Series p. 23-39, (1982).

Table 1
 Dislodgeable Residue Levels of Methidathion in ug/cm²
 Block One

TIME	ROW A	ROW B	MEAN
pre-application	ND	ND	ND
8 hours post	0.99	0.88	0.93
24 hours	0.67	0.83	0.75
48 hours	0.14	0.10	0.12
9 days	0.14	0.14	0.14
17 days	0.017	0.026	0.021
23 days	0.080	0.049	0.064
30 days	0.011	0.011	0.011

Table 2
 Dislodgeable Residue Levels of Methidathion-oxon in ug/cm²
 Block One

TIME	ROW A	ROW B	MEAN
pre-application	ND	ND	ND
8 hours	0.0023	0.0017	0.0020
24 hours	0.0025	0.0020	0.0022
48 hours	0.0030	0.0010	0.0020
9 days	0.0026	0.0025	0.0025
17 days	0.0013	0.0013	0.0013
23 days	0.0051	0.0027	0.0039
30 days	0.0013	0.0012	0.0012

Table 3
 Dislodgeable Residue levels of Methidathion In ug/cm²
 Block Two

TIME	ROW A	ROW B	MEAN
Pre-Application	ND	ND	ND
8 hours	NA	0.54	0.54
24 hours	0.66	0.54	0.60
48 hours	0.32	0.25	0.28
9 days	0.062	0.038	0.050
17 days	0.017	0.015	0.016
23 days	0.038	0.079	0.058
30 days	0.0047	0.0040	0.043

Table 4
 Dislodgeable Residue Levels of Methidathion-oxone In ug/cm²
 Block Two

TIME	ROW A	ROW B	MEAN
pre-application	ND	ND	ND
8 hours	NA	ND	ND
24 hours	0.00155	0.00135	0.00145
48 hours	0.00125	0.00100	0.00112
9 days	0.00155	0.00200	0.00175
17 days	0.00200	0.00100	0.00150
23 days	0.00036	0.00710	0.00370
30 days	0.00097	0.00084	0.00090

ND = none detected (minimum detectable limit = 0.0005 ug/cm²)

NA = not available

Table 5
 Concentration of Methidathion in Leaf Litter ppm
 Block One

TIME	ROW A	ROW B	MEAN
Pre-application	0.22ppm	ND	0.22
8 hours	8.38	1.07	4.72
24 hours	15.72	13.00	14.36
48 hours	5.22	5.43	5.32
9 days	7.40	12.00	9.70
17 days	5.00	4.80	4.90
23 days	14.70	20.15	17.42
30 days	8.50	10.7	9.60

Table 6
 Concentration of Methidathion-oxone in Leaf Litter ppm
 Block One

TIME	ROW A	ROW B	MEAN
Pre-application	ND	ND	ND
8 hours	0.002	0.002	0.002
24 hours	0.019	0.023	0.021
48 hours	0.016	0.009	0.012
9 days	0.019	0.063	0.041
17 days	0.017	0.010	0.013
23 days	0.065	0.080	0.072
30 days	0.003	0.003	0.003

Table 7
 Concentration of Methidathion in Leaf Litter ppm
 Block Two

TIME	ROW A	ROW B	MEAN
Pre-application	0.52	0.39	0.45
8 hours	2.62	3.59	3.10
24 hours	1.60	1.40	1.50
48 hours	3.68	0.52	2.10
9 days	0.19	3.90	2.04
17 days	2.80	6.70	4.75
23 days	7.4	6.10	6.75
30 days	4.95	4.66	4.80

Table 8
 Concentration of Methidathion-oxone in Leaf Litter ppm
 Block Two

TIME	ROW A	ROW B	MEAN
Pre-application	0.045	0.023	0.034
8 hours	0.062	0.044	0.053
24 hours	0.029	0.030	0.029
48 hours	0.014	0.018	0.079
9 days	0.014	0.120	0.067
17 days	0.023	0.290	0.156
23 days	0.510	0.440	0.475
30 days	0.028	0.076	0.052

Appendix 1

WEATHER DATA

Day 1	High	Low	Rainfall
June 28	87	57	
29	88	60	
30	87	60	
July 1	90	59	
2	86	64	
3	91	59	
4	99	66	
5	102	73	
6	93	66	
Day 9-----			
7	85	59	
8	84	57	
9	87	55	
10	94	57	
11	104	63	
12	109	66	
13	110	70	
14	105	73	
Day 17-----			
15	95	63	
16	94	64	
17	87	57	
18	90	59	
19	80	59	
20	89	59	
Day 23-----			
21	97	61	
22	97	64	
23	97	62	
24	95	64	
25	88	60	
26	91	61	
27	95	63	
Day 30-----			
28	97	66	

Appendix 2

CALIFORNIA AIR RESOURCES BOARD
BASIC TAB REPORT

POLLUTANT	44201	OZONE
COLLECTION METHOD	14	INSTRUMENTAL
ANALYSIS METHOD		UV PHOTOMETRIC
UNITS	40	PPHM

AIR BASIN : 09 : SAN JOAQUIN VALLEY
 STATION : 1000234 : FRESNO-OLIVE
 AGENCY : A : ARB-ATMOSPHERIC SURV
 PROJECT : 11 : POPULATION ORIENTED
 LINE : 1983

DAY		HOUR (PST)												
00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	2	2	2	1	1	1	1	1	2	3	4	4	4	4
2	2	2	2	2	2	2	2	2	3	3	4	5	6	6
3	1	1	0	1	1	1	1	1	2	5	5	6	6	6
4X	2	1	1	1	1	1	1	1	2	4	5	6	6	6
5X	2	1	1	1	1	1	1	1	2	4	5	6	6	6
6	2	1	1	1	1	1	1	1	2	4	5	6	6	6
7	2	1	1	1	1	1	1	1	2	4	5	6	6	6
8	0	1	0	1	0	1	0	1	2	4	5	6	6	6
9	2	1	1	0	1	0	1	0	2	4	5	6	6	6
10	2	1	1	1	1	1	1	1	2	4	5	6	6	6
11X	3	2	2	1	0	1	0	1	2	4	5	6	6	6
12X	3	2	2	1	0	1	0	1	2	4	5	6	6	6
13	0	1	0	1	0	1	0	1	2	4	5	6	6	6
14	1	0	1	0	1	0	1	0	2	4	5	6	6	6
15	2	1	1	1	1	1	1	1	2	4	5	6	6	6
16	2	2	1	1	1	1	1	1	2	4	5	6	6	6
17	2	2	2	1	1	1	1	1	2	4	5	6	6	6
18X	2	2	2	1	1	1	1	1	2	4	5	6	6	6
19X	2	2	2	1	1	1	1	1	2	4	5	6	6	6
20	2	2	2	1	1	1	1	1	2	4	5	6	6	6
21	2	2	2	1	1	1	1	1	2	4	5	6	6	6
22	2	2	2	1	1	1	1	1	2	4	5	6	6	6
23	1	1	0	1	1	1	1	1	2	4	5	6	6	6
24	2	2	2	1	1	1	1	1	2	4	5	6	6	6
25X	1	2	1	1	1	1	1	1	2	4	5	6	6	6
26X	3	3	2	1	1	1	1	1	2	4	5	6	6	6
27	1	1	1	1	1	1	1	1	2	4	5	6	6	6
28	2	1	1	1	1	1	1	1	2	4	5	6	6	6
29	2	1	1	1	1	1	1	1	2	4	5	6	6	6
30	2	1	1	1	1	1	1	1	2	4	5	6	6	6
Ave	2.0	2.0	1.8	1.5	0.9	0.9	2.0	2.0	3.8	5.4	6.0	6.0	6.0	6.0
Max	2	2	3	3	3	2	2	3	4	5	5	6	9	9

Appendix 2 (cont'd)

CALIFORNIA AIR RESOURCES BOARD
BASIC TAB REPORT

POLLUTANT : 44201 : OZONE
COLLECTION METHOD : 14 : INSTRUMENTAL
ANALYSIS METHOD : 14 : UV PHOTOMETRIC
UNITS : 40 : PPHM

AIR BASIN : 09 : SAN JOAQUIN VALLEY
STATION : 1000234 : FRESNO-OILIVE
AGENCY : A : ARB-ATMOSPHERIC SURV
PROJECT : 11 : POPULATION ORIENTED
JULY : 1983 :

HOUR (PST)

DAY	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG CONC	MAX CONC	HR		
1	1	1	0	0	0	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1.4	22	2	
2X	0	0	0	0	1	1	1	2	2	2	2	2	2	3	4	4	4	4	4	4	4	3	2	2	2	2	22	4	
3X	2	1	1	1	1	2	2	3	4	5	6	6	6	6	6	6	6	6	6	6	5	2	1	1	1	1	3.2	22	6
4X	1	1	1	1	1	2	2	3	5	7	9	8	7	7	7	7	6	6	6	6	5	3	3	3	3	3	3.3	22	6
5	1	1	1	1	1	1	1	1	1	1	4	6	9	8	7	7	7	6	6	6	5	2	2	2	2	2	2.6	22	4
6	2	2	2	1	1	1	1	1	2	2	2	2	3	4	5	5	5	5	5	5	4	4	4	4	4	4	3.1	22	5
7	2	2	2	1	1	1	1	1	1	1	1	2	2	3	3	4	4	5	5	5	4	4	4	4	4	4	2.6	22	4
8	2	1	1	0	0	0	1	1	1	1	1	1	2	2	3	4	4	4	4	4	4	3	3	3	3	3	2.4	22	4
9X	0	0	0	0	0	1	2	2	3	4	5	6	6	7	8	7	7	6	6	6	5	2	1	1	1	1	2.5	22	4
10X	0	0	0	0	0	1	2	2	3	4	5	6	6	7	8	7	7	6	6	6	5	2	1	1	1	1	2.5	22	8
11	0	0	0	0	0	1	2	2	3	4	5	6	7	8	9	8	7	6	5	4	3	2	3	3	3	3.9	22	8	
12	0	0	0	0	0	1	1	1	1	1	1	2	2	3	4	4	4	4	4	4	4	3	2	2	2	2	4.7	22	11
13	2	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4	4	4	4	4	4	3	2	2	2	2	4.7	22	11
14	2	2	1	0	0	1	1	1	1	1	1	1	2	2	3	4	4	4	4	4	4	3	2	2	2	2	5.1	22	11
15	2	2	1	0	0	1	1	1	1	1	1	1	2	2	3	5	6	7	8	9	10	9	8	7	6	5	4.7	22	11
16X	2	2	2	1	1	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	9	10	11	12	13	13	19		
17X	2	1	1	0	0	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	9	10	11	12	13	13	22		
18	2	2	2	1	1	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	9	10	11	12	13	13	22		
19	2	2	2	1	1	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	9	10	11	12	13	13	22		
20	2	2	2	1	1	1	1	1	1	1	1	1	2	2	3	5	5	5	5	5	5	5	5	5	5	5	11		
21	2	1	1	1	1	1	1	1	1	1	1	1	2	2	3	5	6	7	8	9	10	11	12	13	13	22			
22	2	1	1	1	1	1	1	1	1	1	1	1	2	2	3	5	6	7	8	9	10	11	12	13	13	22			
23X	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	5	6	7	8	9	10	11	12	13	13	22			
24X	2	2	1	1	1	1	1	1	1	1	1	1	2	2	3	5	6	7	8	9	10	11	12	13	13	22			
25	2	2	1	1	1	1	1	1	1	1	1	1	2	2	3	5	6	7	8	9	10	11	12	13	13	22			
26	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4	4	4	4	4	4	4	4	4	4	4	4.9		
27	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4	4	4	4	4	4	4	4	4	4	4	4.9		
28	2	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4	6	8	8	8	8	8	7	7	7	7	7		
29	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4	6	8	8	8	8	8	7	7	7	7	7		
30X	2	1	1	1	1	1	1	1	1	1	1	1	3	6	9	9	9	7	7	7	7	7	6	6	6	6	6		
31X	2	2	1	1	1	1	1	1	1	1	1	1	2	3	4	7	8	9	9	9	9	9	9	9	9	9	9		
AVE	1.5	0.9	0.7	1.2	1.0	3.2	4.3	5.4	6.6	6.3	6.6	6.6	6.6	6.6	6.6	6.6	5.8	5.4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.7		
N	31	31	31	31	29	30	30	31	31	30	30	30	30	30	30	30	29	29	30	30	30	31	31	31	31	31	31		
MAX	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	

RUN DATE 01/10/84

Appendix 3

CALIFORNIA AIR RESOURCES BOARD
BASIC TAB REPORT

POLLUTANT : 42603 : OXIDES OF NITROGEN
 COLLECTION METHOD : 14 : INSTRUMENTAL
 ANALYSIS METHOD : : CHEMILUMINESCENT
 UNITS : 40 : PPHM

AIR BASIN : 09 : SAN JOAQUIN VALLEY
 STATION : 1000234 : FRESNO-OLIVE
 AGENCY : A : ARB-ATMOSPHERIC SURV
 PROJECT : 11 : POPULATION ORIENTED
 JUNE : 1983

DAY	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE CONC	MAX CONC	HR	N				
1	1	1	2	2	4	5	4	3	2	2	2	2	2	2	2	3	3	3	4	3	3	2	1	1	2.5	22	5	07				
2	1	1	1	2	3	5	3	2	2	2	2	2	2	2	2	3	3	3	4	3	3	2	2	2	2.4	22	4	19				
3	2	2	2	3	5	5	4	4	4	3	3	3	3	2	2	2	3	3	4	3	3	3	2	1	3.6*	14	5*	05				
4X	2	2	3	3	4	4	4	3	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	3.1	22	5	19				
5X	3	3	3	3	4	3	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	3.5	22	8	22				
6	3	4	4	4	4	4	5	5	4	5	5	4	4	4	4	4	4	4	5	5	5	2	2	2	3.7*	20	9*	05				
7	3	4	6	6	5	5	4	5	5	4	5	5	4	4	4	4	4	4	5	5	5	2	2	2	3.4	20	5	06				
8	2	2	1	2	2	2	3	4	5	5	4	5	5	4	4	4	4	4	5	5	5	2	2	2	3.2*	20	5*	06				
9	1	1	1	2	2	2	3	4	5	5	4	5	5	4	4	4	4	4	5	5	5	2	2	2	3.2	22	7	05				
10	1	1	1	2	2	2	3	5	6	7	6	7	6	7	6	7	7	6	7	7	6	5	6	7	2.0	22	5	20				
11X	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	1.8	22	11	22*				
12X	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	6.6*	20	22*	21				
13	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	3.0	22	8	02				
14	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	3.3	22	6	20				
15	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	3.3	22	8*	06				
16	2	2	3	5	6	8	5	6	9	9	7	6	10	8	7	6	8	9	10	11	6	5	4	5	2.5	22	11	21				
17X	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	3.5	22	9	06				
18X	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	2.5	22	4	19				
19X	2	2	2	3	4	7	8	7	6	5	4	3	2	2	2	1	2	2	2	2	2	2	1	2	2.5	22	6	20				
20	2	2	3	4	7	8	7	6	5	4	3	2	2	2	2	1	2	2	2	2	2	2	1	2	3.5*	21	8*	06				
21	2	2	2	3	4	5	5	6	5	4	3	2	2	2	2	1	2	2	2	2	2	2	1	2	3.1	22	6	20				
22	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	3.1*	22	8	06				
23	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	3.1*	22	5*	05				
24	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	4.0	22	7	20				
25X	3	3	3	4	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4	3	4	3.1	22	5	05				
26X	3	2	2	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	1	2	2.0	22	3	02				
27	1	1	1	2	3	4	5	4	3	2	3	4	5	4	3	2	3	3	3	3	3	3	2	3	2.9*	22	5	06				
28	1	1	1	2	2	4	5	4	3	2	3	4	5	4	3	2	3	3	3	3	3	3	2	3	3.0	22	5	06				
29	1	1	1	2	2	4	5	5	5	5	5	5	5	5	5	3	3	3	3	3	3	3	2	3	3.0	22	5	06				
30	1	1	1	2	2	4	5	5	5	5	5	5	5	5	5	3	3	3	3	3	3	3	2	3	3.0	22	5	06				
AVE	2.0	2.0	2.0	3.0	4.0	4.8	5.0	5.3	5.5	5.6	5.3	5.0	5.5	5.6	5.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	2.0	3.2	6.5*					
N	1	1	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
MAX	2	2	8	7	6	10	9	6	5	4	4	3	3	3	3	4	4	5	6	10	18	22	18	11	6.6*	22	RUN DATE	01/10/84				

Appendix 3 (cont'd)

CALIFORNIA AIR RESOURCES BOARD
BASIC TAB REPORT

POLLUTANT : 42603 : OXIDES OF NITROGEN
 COLLECTION METHOD : 14 : INSTRUMENTAL
 ANALYSIS METHOD : 3 : CHEMILUMINESCENT
 UNITS : 40 : PPHM

AIR BASIN : 09 : SAN JOAQUIN VALLEY
 STATION : 1000234 : FRESCO-OLIVE
 AGENCY : A : ARB-ATMOSPHERIC SURV
 PROJECT : 11 : POPULATION ORIENTED
 JULY : 1983 :

DAY	HOUR (P S T)												MAXIMUM CONC N CONC HR N
	00	01	02	03	04	05	06	07	08	09	10	11	
1	2	2	4	5	6	5	3	3	3	3	4	4	3
2X	2	2	1	2	2	3	3	2	2	2	2	2	2
3X	2	2	2	2	2	3	2	2	2	1	1	1	1
4X	5	5	4	3	3	2	2	2	2	1	2	2	2
5	4	4	5	5	7	16	12	4	3	3	3	3	3
6	2	2	2	4	5	4	3	4	3	3	4	4	3
7	1	1	1	3	4	5	4	3	3	3	4	4	3
8X	1	2	4	4	5	5	4	3	3	3	4	4	3
1CX	4	4	4	4	4	5	4	3	3	3	4	4	3
11	7	4	5	7	10	9	7	6	5	4	4	4	3
12	5	6	4	7	10	9	7	6	5	4	4	4	3
13	4	5	5	7	8	7	6	5	4	3	4	4	3
14	2	2	2	2	4	7	6	5	4	3	4	4	3
15	2	2	2	2	4	7	6	5	4	3	4	4	3
16X	2	2	2	3	2	2	2	2	2	2	2	2	2
17X	1	2	3	4	5	5	4	3	3	3	4	4	3
18	2	1	1	2	3	4	5	4	3	3	4	4	3
19	1	1	1	2	2	4	5	4	3	3	4	4	3
20	1	1	1	2	2	4	5	4	3	3	4	4	3
21	3	3	5	6	7	6	5	4	3	2	3	2	2
22	3	2	3	3	4	5	4	3	2	2	3	2	2
23X	3	3	3	4	5	5	4	3	2	2	3	2	2
24X	2	2	2	3	3	5	5	4	3	2	3	2	2
25	1	1	2	2	3	5	5	4	3	2	3	2	2
26	2	2	3	4	7	6	7	6	5	4	4	4	3
27	3	3	5	7	6	7	6	5	4	3	3	2	2
28	2	2	3	5	7	8	7	6	5	4	4	4	3
29	2	2	4	6	7	5	4	3	3	2	3	2	2
30X	3	3	5	6	6	6	5	4	3	2	3	2	2
31X	3	2	2	4	4	5	4	3	2	2	3	3	2
AVE	2.5	3.7	5.0	5.5	3.3	3.1	2.7	2.3	2.5	2.0	3.2	4.1	3.7
N	31	31	31	29	30	30	31	31	30	29	29	30	31
MAX	7	6	7	10	16	12	5	5	6	4	3	3	5

SUN DATE 01/10/R4

Appendix 4

CALIFORNIA AIR RESOURCES BOARD
BASIC TAB REPORT

POLLUTANT : 42401 : SULFUR DIOXIDE
 COLLECTION METHOD : 20 : INSTRUMENTAL
 ANALYSIS METHOD : 40 : PULSED FLUORESCENCE
 UNITS : ppm

AIR BASIN : 09 : SAN JOAQUIN VALLEY
 STATION : 1000234 : FRESNO-OLIVE
 AGENCY : A : ARB-ATMOSPHERIC SURV
 PROJECT : 11 : POPULATION ORIENTED
 JUNE : 1983 :

HOUR CPS T)

DAY	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE CONC	N CONC HR	M	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	22	0.00	M	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	20	1.18	M	
3	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7*	18	1.06	M
4X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1.02	H
5X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1.02	H
6	1	1	1	1	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6*	17	1.32	M	
7	1	1	1	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7*	6	2.04	M	
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	20	0.00	M	
9	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	22	1.07	M
10	1	1	1	1	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	22	1.07	M
11X	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.0	22	1.02	M
12X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9*	22	1.04	M
13	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	22	1.02	M	
14	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	22	1.02	M	
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1.02	M
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	2.21	M
17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1.02	M
18Y	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1.02	M
19X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1.02	M
20	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2*	21	1.02	M	
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	22	0.00	M	
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	22	0.00	M	
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3*	22	1.20	M	
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	22	1.02	M	
25X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1.02	M
26X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	22	1.02	M
27	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	22	1.05	M
28	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	22	1.02	M
29	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	22	1.02	M
30	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5	22	1.06	M
Ave	0.0	0.6	0.6	0.6	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.9*		
N	1	1	29	29	29	29	24	27	28	27	28	27	26	27	28	29	28	29	28	28	29	30	613	30				
Max	0	0	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.7*	2			

Appendix 4 (cont'd)

CALIFORNIA AIR RESOURCES BOARD
BASIC TAB REPORT

POLLUTANT : 42401 : SULFUR DIOXIDE
 COLLECTION METHOD : 20 : INSTRUMENTAL
 ANALYSIS METHOD : 40 : PULSED FLUORESCENCE
 UNITS : 40 : PPM

AIR BASIN : 09 : SAN JOAQUIN VALLEY
 STATION : 1000234 : FRESNO-OLIVE
 AGENCY : A : ARB-ATMOSPHERIC SURV
 PROJECT : 11 : POPULATION ORIENTED
 JULY : 1983 :

HOUR (PST)

DAY	HOUR (PST)												AVE CONC	MAX CONC	N										
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	0.6	22	1	05.4	
2X	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	22	1	02.4	
3X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	22	1	02.4	
4X	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	22	1	05.4	
5	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	20	1	06.4	
6	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	22	1	02.4	
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.6	22	1	02.4
8X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.6	22	1	02.4
10X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.6	22	1	02.4
11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	21	1	02.4
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.4	22	1	02.4
13	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.4	22	1	03.4
14	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	22	1	03.4
15	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5.0*	18	1	05.4
16X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1	02.4
17X	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	22	1	02.4	
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6*	20	0	0.2	
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	22	1	18	
20	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0.7	22	1	06.4
21	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22	1	02.4
22	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1	02.4
23X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1	02.4
24X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6*	16	1	02.4
25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	22	1	06.4
26	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	22	1	06.4
27	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1	02.4
28	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1	02.4
29	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1	02.4
30X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22	1	02.4
31X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	22	1	02.4
AVG	0.7	0.7	0.9	0.9	0.8	0.8	0.8	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	1.0		
MIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAX	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

01/10/94 01:00 TR 01/10/94

TABLE III - LEVELS OF DISLodgeABLE PARATHION AND PARAoxON RESIDUES PRESENT AT SPECIFIED SAMPLING INTERVALS FOR THE THREE ORCHARDS SAMPLED REPORTED IN ug/cm²

Row	Presample	Postsample		24 Hours (12 Hours)		48 Hours (36 Hours)		72 Hours (60 Hours)		7 days		14 days		21 days		28 days		
		P	PO	P	PO	P	PO	P	PO	P	PO	P	PO	P	PO	P	PO	P
South 1	ND	ND	0.65	ND	0.11	ND	0.023	ND	0.008	ND	.00064	.0014	ND	ND	ND	ND	ND	ND
South 2	NS	NS	0.54	ND	0.18	ND	0.024	ND	0.013	ND	.0022	.0027	ND	ND	ND	ND	ND	ND
North	ND	ND	0.61	ND	0.06	ND	0.019	ND	0.0074	.0038	.0013	.0013	ND	ND	ND	ND	ND	ND
Mean	0	0	0.60	0	0.12	0	0.022	0	0.0094	0.0012	0.0013	0.0018	0.0001	0.0001	0	0	0	0
West 1	ND	ND	0.89	ND	0.12	ND	.039	ND	.020	.016	.00097	.00091	.00078	.00074	ND	ND	ND	NS
West 2	ND	ND	0.83	ND	0.19	ND	.079	.0056	.023	.029	.00076	.00099	ND	ND	ND	ND	ND	NS
East	NS	NS	0.69	ND	0.12	ND	.060	.007	.026	.029	.0011	.00116	ND	.00055	ND	ND	ND	NS
Mean	0	0	0.80	0	0.14	0	0.059	0.042	0.023	0.025	0.0094	0.0010	0.0004	0.0004	0	0	0	0
4	ND	ND	0.53	ND	(0.34)	(.011)	(0.37)	(.014)	(.033)	(.0048)	.00095	.0023	ND	ND	ND	ND	ND	ND
5	ND	ND	0.71	ND	(0.30)	(.016)	(0.39)	(.011)	(.022)	(.0048)	.00367	.0037	ND	ND	ND	ND	ND	ND
6	NS	NS	0.95	ND	(0.50)	(.024)	(0.29)	(.015)	(.022)	(.0058)	.00277	.0032	ND	ND	ND	ND	ND	ND
Mean	0	0	0.73	0	(0.38)	(0.017)	(0.35)	(0.013)	(0.025)	(.0051)	.0024	.0030	0	0	0	0	0	0

ND = None Detected
NS = No Sample

P = Parathion MDL = 3×10^{-4} ug/cm²
PO = Paraoxon MDL = 4×10^{-4} ug/cm²

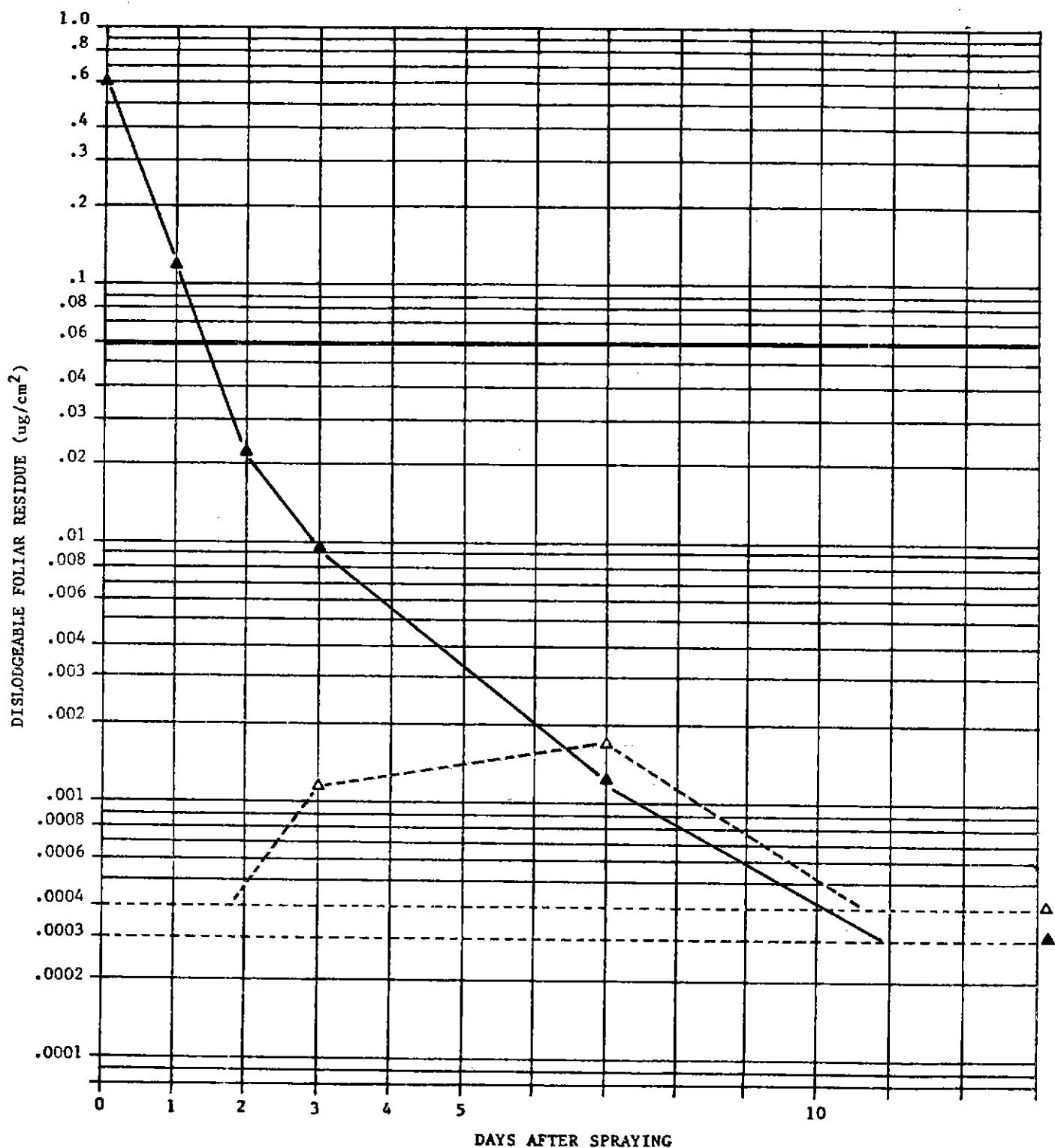


Figure 1 - Mean value degradation rates of dislodgeable parathion (closed symbols) and paraoxon (open symbols) residues from the foliage of apricot trees of Grower One (2 lbs AIA). Dashed horizontal lines near the bottom are minimum detectable levels for parathion and paraoxon. The heavy horizontal line at 0.06 ug/cm² represents the calculated safe level for thion + oxon.

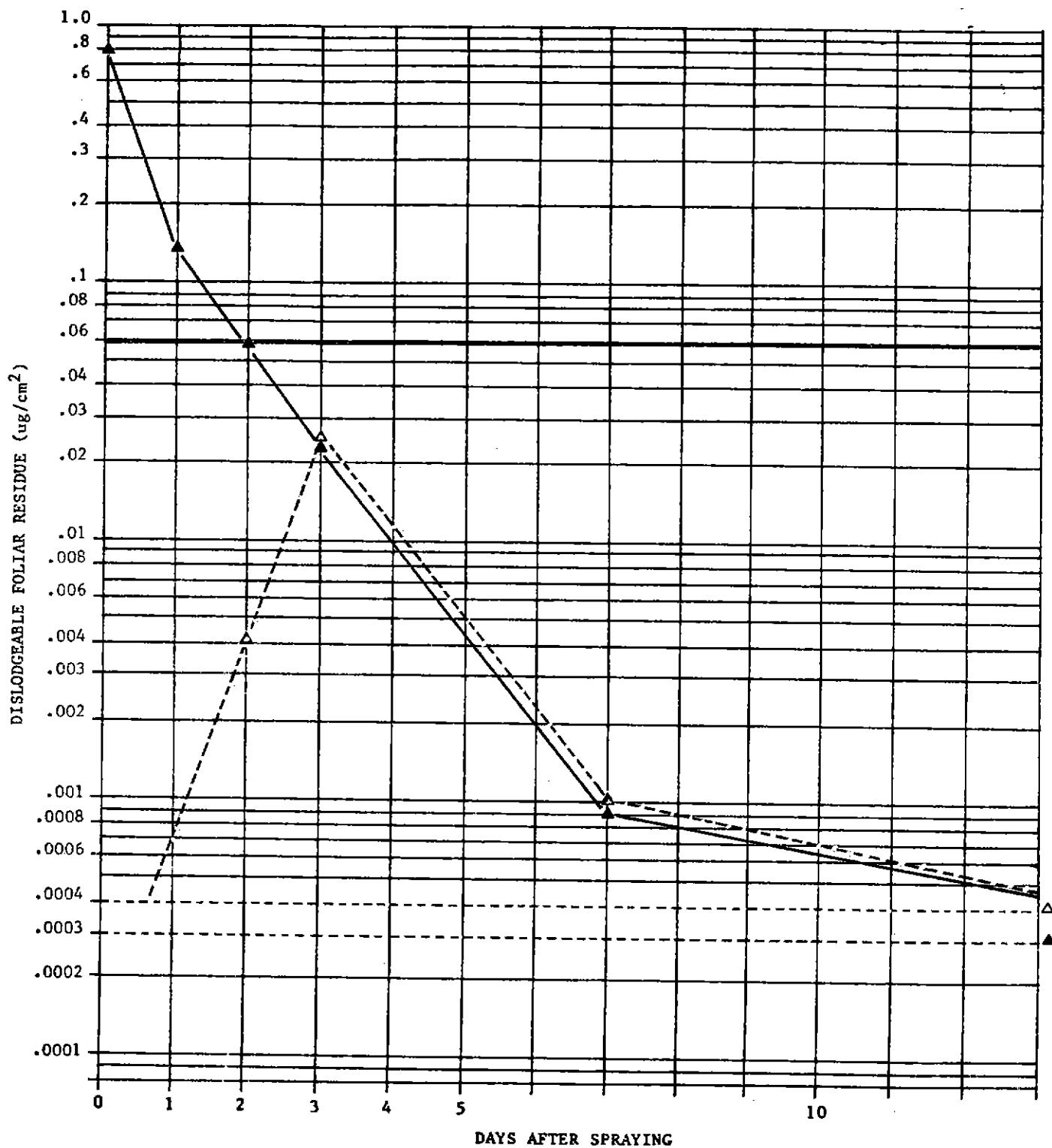


Figure 2 - Mean value degradation rates of dislodgeable parathion (closed symbols) and paraoxon(open symbols) residues from the foliage of apricot trees of Grower Two (1.5 lbs AIA).

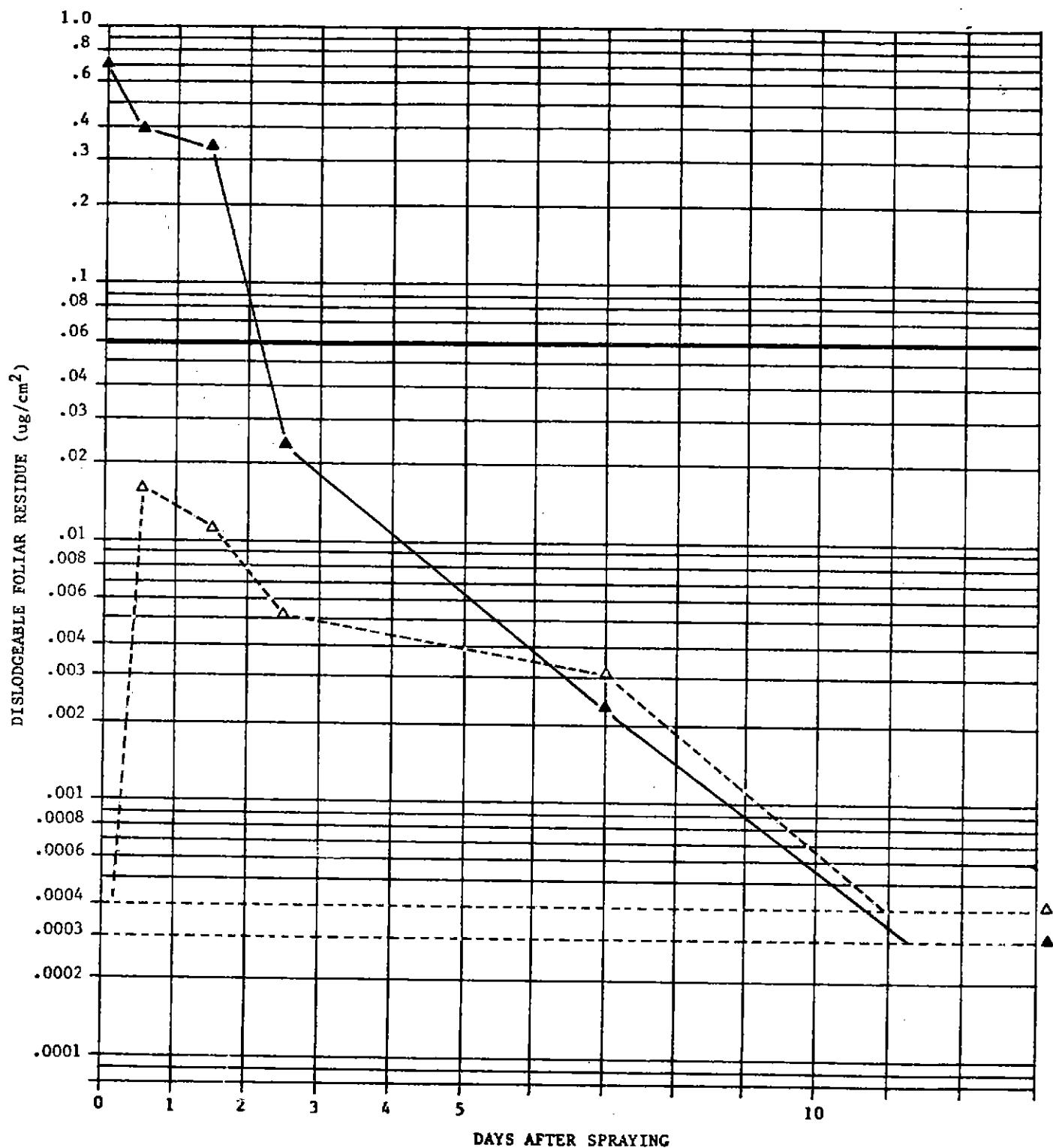


Figure 3 - Mean value degradation rates of dislodgeable parathion (closed symbols) and paraoxon (open symbols) residues from the foliage of apricot trees of Grower Three (2 lbs. AIA).

LITERATURE CITED

1. Iwata, Y., J. B. Knaak, R. C. Spear, and R. J. Foster: Worker Reentry into Pesticide Treated Crops. I. Procedure for the Determination of Dislodgeable Pesticide Residues on Foliage. Bull. Environ. Contam. Toxicol. 18: 649 (1977).
2. Spencer, W. F., Y. Iwata, W. W. Kilgore, and J. B. Knaak: Worker Reentry into the Pesticide Treated Crops. II. Procedures for the Determination of Pesticide Residues on the Soil Surface. Bull. Environ. Toxicol. 18: 656 (1977).
3. Spear, R. C., W. J. Popendorf, W. F. Spencer, and T. H. Milby: Worker Poisonings Due to Paraoxon Residues. J. Occup. Med. 19: 411 (1977).
4. Nabb, D. P., W. J. Stein, and W. J. Hayes, Jr: Rate of Skin Absorption of Parathion and Paraoxon. Arch. Environ. Health 12: 501 (1966).
5. Gunther, F. A., W. E. Westlake, J. H. Barkley, W. Winterlin and L. Langbehn: Establishing Dislodgeable Pesticide Residues on Leaf Surfaces. Bull. Environ. Contam. Toxicol. 9: 243 (1973).
6. Knaak, J. B., and Y. Iwata: The Safe Level Concept and the Rapid Field Method - A New Approach to Solving the Reentry Problem. A.C.S. Symp. Ser. (1982).
7. Popendorf, W. J. and J. T. Leffingwell: Natural Variations in the Delay and Oxidation of Parathion Foliar Residues. Agric. Food Chem. 26: 437 (1978).